PB-227 576

SEDIMENTATION IN THE OHIO RIVER BASIN

Federal Water Pollution Control Administration
Wheeling, West Virginia

June 1968

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

PB 227 576

SEDIMENTATION

IN THE

OHIO RIVER BASIN

WORK DOCUMENT NO. 22

This document has been prepared to record a specific water pollution control activity carried out to date in the furtherance of the water pollution control program being developed in the Ohio River Basin. The information contained herein will serve as a ready reference to aid in the planning and development of the program in the Basin, for appropriate in-service training of participating personnel, and facilitating program activities with other cooperating groups.

Questions or comments relative to this material should be directed to:

Planning and Evaluation Section
Wheeling Field Station
Ohio River Basin Project
Wheeling, West Virginia

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

UNITED STATES DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
OHIO BASIN REGION

June 1968

36

TABLE OF CONTENTS

		PAGE
	INTRODUCTION	1
I.	SUMMARY AND CONCLUSIONS	2
II.	AVAILABLE DATA	4
III.	SEDIMENTATION IN THE OHIO RIVER BASIN OCCURRENCE AND EVALUATION	5
IV.	APPENDIX	17
	A. Factors Affecting Sediment Origin, Transportation, and Deposition	17
	B. Land Resource Regions of the Basin	22
V.	BIBLIOGRAPHY	32

LIST OF TABLES AND FIGURES

		PAGE
Table 1.	Average Annual Suspended Sediment Yields	7
Table 2.	Summary of Reservoir Sedimentation	10
Table 3.	Comparison of Reservoir Sedimentation Rates in Major Basins	13
Table 4.	Annual Sediment Accumulation	14
Table 5.	Scale of Particle	18
Figure 1.	Map of Eastern United States	23
Figure 2.	Land Resource Areas	24
Figure 3.	Agricultural Land Use	31

INTRODUCTION

Sedimentation is not synonymous to but is a corollary of soil erosion. Any factor which increases the amount and rate of erosion also increases the sedimentation potential. Wind and water are the chief agents in removing and transporting soil materials from their place of origin. Since wind erosion is insignificant in humid-temperate areas such as the Ohio River Basin, this report covers only erosion by water. Sediments result from erosion from mining, logging, dredging, or irrigation operations, gravel washings, discharge from steel mills, the precipitation of certain industrial dusts such as those from limestone saw mills, and also from operations in cotton and wood-cleansing plants, and in certain other industrial and manufacturing operations.

Sediment is a major pollutant of surface waters. In some watersheds, it is the chief pollutant. When sufficiently concentrated, suspended sediments are very harmful to aquatic life. Sediments reduce fish and aquatic life populations by blanketing fish nests, spawn, and food supplies and may seriously alter the stream ecology. The amount of available light is reduced to green aquatic plants whose growth is essential to the maintenance of an adequate dissolved oxygen balance in water. Sediments contribute to problems involved in assimilation of oxygen-demanding organic pollutants by streams and lakes. Nutrient-rich sediments promote excessive algae growth in streams and accelerate the eutrophication process of lakes. Furthermore, sediments may add to the treatment costs for municipal and industrial water supplies, erode power turbines and pumping equipment, and plug filters. The depletion of reservoir storage capacities from sediment loadings is a well known and serious problem. Sediments in suspension also reduce the aesthetic value of streams and lakes. Sediment deposits in channels are harmful in several ways. They may:

a. Accumulate in navigation channels and harbors.

b. Increase the frequency of flooding by reducing channel capacity.

c. Cause costly destruction by blanketing valuable agriculture land.

d. Cause extensive damage to structures, contents of structures, and mechanical equipment.

This report is a summary of available information on the production and accumulation of sediments in the Ohio River Basin and an appraisal of the magnitude of the problem.

I. SUMMARY AND CONCLUSIONS

1. Stream sediment yield data and reservoir sedimentation rate data are insufficient for most parts of the Ohio River Basin to make a valid statistical comparison among either the major sub-basins or the land resource areas within the basin.

2. Due to the many variables involved in the erosion and sedimentation process, it is extremely difficult to single out one or two factors as the chief contributors to the sedimentation problem in a large area such as a major sub-basin or a land resource area.

3. Even small watersheds present a complex hydrological picture.

4. Sediments are a major stream polluting factor in much of the Big Sandy, Little Kanawha, Kentucky, and Licking sub-basins. Considerable sediment production also occurs in much of the Beaver, Miami, and Wabash sub-basins. Sediment accumulation rates are low, generally, in the Allegheny, Kanawha, Monongahela, Scioto, and Tradewater sub-basins. Sedimentation in other major sub-basins of the Ohio River Basin is intermediate in comparison with the sub-basins named above.

5. Overall, sedimentation in the Ohio River Basin is not very great in comparison with rates recorded in some parts of the western United States, such as the plateau and plains regions, but it is significant throughout the basin.

6. Chief contributors to high erosion and sediment production in the Ohio Basin are:

a. Improper land use in rural areas including poor soil conservation practices in some areas.

b. Certain strip mining operations and poor reclamation of strip mined areas.

c. Highly erosive soils in some areas in combination with poor land management of those areas.

d. Logging operations and poor forestry management in some areas.

e. Building and other construction practices whereby extensive areas of unprotected soil material lies exposed to the elements over an extended time period.

7. Corrective measures are needed to abate the sediment problem in the Ohio River Basin.

8. More sedimentation data are needed to better evaluate the problem in the basin.

II. AVAILABLE DATA

Factual data on sediment movement in the Ohio River Basin derived from or verified by field measurements are sparse, spotty, and of somewhat limited value to a basin wide study. Theoretical information and estimated values are in more abundant supply.

Most of the work on sedimentation has been sponsored by the U. S. Department of Agriculture, the U. S. Army Corps of Engineers, the U. S. Department of the Interior, T.V.A., and by certain state agencies. "Although many agencies have collected sediment records, the available information is inadequate to determine sediment concentrations or discharges in more than a rough way for many streams or parts of streams in the United States." 1/

1/ Bruce R. Colby, Fluvial Sediments - A Summary of Source, Transportation, Deposition, and Measurement of Sediment Discharge, Geological Survey Bulletin 1181-A, U. S. Department of the Interior, 1963; page A2.

III. SEDIMENTATION IN THE OHIO RIVER BASIN - OCCURRENCE AND EVALUATION

Suspended sediment stream discharge and reservoir sedimentation rates vary widely in different parts of the Ohio River Basin. In order to evaluate relative rates of erosion, the U. S. Army Corps of Engineers compared sediment yields at various locations in the basin. 1/

Table 1 gives average annual suspended sediment yields for 26 stations in the Ohio River Basin. The yields were obtained during the period 1952 - 1962. At five stations, however, yield data were available for only two years; and the years of record within the period (1952-1962) vary among some of the stations. All attempts to make a valid comparison of sediment yields among the stations were frustrated due either to insufficient data or the absence of information concerning the many variables or parameters controlling yield values.

An attempt was made, however, to compare the average annual yields among the land resource areas within which the stations occur. The stations within the land resource areas are too few in number in most cases for a statistical analysis, consequently conclusions drawn from the following data (obtained from Table 1) are more speculative than indicative:

Land Resource Area	Average Annual Yields At Stations Listed In Table 1 (Tons/sq.mi.)	Average Value (Tons/sq.mi.)	Median Value (Tons/sq.mi.)
M-111	164; 148; 130; 130; 122; 172; 357	175	148
M-114	99; 92; 42; 563	199	96
N-120	370; 69	220	220
N-121	509; 388; 625; 1,460	746	567
N-122	370; 240	305	305
N-124	113; 262; 219	198	219
N-125	326; 357; 343; 467; 509	400	357

From the above data an inference can be drawn that sedimentation rates are relatively high at the stations located in land resource areas N-121, N-122, and N-125 and relatively low in M-111 and M-114. See Figure 2 in the Appendix for the location and description, respectively, of these land resource areas.

1/ Ohio River Basin Comprehensive Survey, Appendix C, Hydrology, U. S. Army Engineer Division, Ohio River, Cincinnati, Ohio.

Table 2 is a summary of reservoir sedimentation surveys for the Ohio River Basin made through 1960. 1/ This table shows a wide variation among the reservoirs in average annual sediment accumulation per square mile over various periods both in acre feet and in tonnage. The density of the sediment also varies considerably among some of the reservoirs.

As outlined in the Appendix erosion rates and sediment accumulation values are dependent on a large number of variables. The nature and magnitude of each parameter or variable in combination determines the amount of sedimentation. Most of the parameters result from natural phenomena, but others are man influenced, e.g., land use and engineering works such as types, sizes, and numbers of water retention structures in stream channels.

Due to the impossible task of evaluating the relative importance of each variable in each watershed and of making a meaningful comparison of the differences in climatic and hydrologic conditions among the various survey periods, comparisons of sediment accumulations among watersheds are difficult to make. An attempt was made, however, keeping in mind the difficulties outlined above, to compare reservoir sedimentation rates among some of the major sub-basins of the Ohio River Basin (Table 3).

An evaluation of the data as presented in Table 3 indicates high sedimentation accumulation rates in most of the reservoirs in the Beaver, Kentucky, Licking, and Miami basins, high rates in many of the reservoirs in the Wabash basin, moderate rates for half or more of the reservoirs in the Hocking, Little Miami, and Muskingum basins, and low rates in most or all of the reservoirs in the Allegheny, Kanawha, Monongahela, and Scioto basins.

The ratings for the basins and limits defining the ratings are given in Table 4 below. Both the ratings and the limits chosen are somewhat arbitrary and are intended to represent only the Ohio River Basin. A "high" value here might be "low" in some western areas of the United States. The ratings are based, however, on a study of information found in references (1) and (2).

1/ Adapted from "Summary of Reservoir Sediment Deposition Surveys Made in the United States Through 1960." Miscellaneous Publication No. 964. Agricultural Research Service. U. S. Department of Agriculture.

TABLE 1

AVERAGE ANNUAL SUSPENDED SEDIMENT YIELDS
IN TONS PER SQUARE MILE FOR STATIONS IN THE OHIO RIVER BASIN

Land Resource Area	Sub-Basin	Station	Discharge Area (Sq. Miles)	Average Annual Yield	Number of Years
N-124	Muskingum River Basin	Muskingum River	5,982	113	10
N-124	Hocking River Basin	Hocking River at Athens, Ohio	944	262	6
N-125	Tygarts Creek Basin	Tygarts Creek near Greenup, Kentucky	242	326	6
N-125	Cumberland River Basin	Cumberland River at Williamsburg, Kentucky	1,607	357	9
N-125	Licking River Basin	Licking River at Farmers, Kentucky	831	343	2
N-125	Big Sandy River Basin	Levisa Fork at Paintsville, Kentucky	2,143	467	2
M-111	Great Miami River Basin	Miami River at Dayton, Ohio	2,513	164	2
M-114	Little Miami River Basin	Little Miami River near Oldtown, Ohio	129	99	6
M-114	Little Miami River Basin	Little Miami River near Selma, Ohio	51	92	6
M-114	Little Miami River Basin	North Fork Little Miami River near Pitchin, Ohio	29	42	6

TABLE 1 (continued)

Land Resource Area	Sub-Basin	Station	Discharge Area (Sq.Miles)	Average Annual Yield	Number of Years
M-114	Little Miami River Basin	Todd Fork at Rochester, Ohio	219	563	6
M-111	Little Miami River Basin	Massie Creek at Wilberforce, Ohio	64	148	6
M-111	Little Miami River Basin	North Fork Massie Creek at Cedarville, Ohio	26	130	4
M-111	Little Miami River Basin	South Fork Massie Creek at Cedarville, Ohio	20	130	4
N-124	Scioto River Basin	Scioto River at Higby, Ohio	5,129	219	9
M-111	Scioto River Basin	Scioto River at Prospect, Ohio	571	122	2
M-111	Scioto River Basin	Big Walnut Creek at Central College, Ohio	191	172	2
M-111	Scioto River Basin	Paint Creek near Bourneville, Ohio	808	357	6
N-121 N-125	Licking River Basin	Licking River at McKinneysburg, Kentucky	2,280	509	10
N-121	Kentucky River River Basin	Kentucky River at Frankfort, Kentucky	5,412	388	10
N-121	Salt River Basin	Salt River at Shepherdsville, Kentucky	1,190	635	9
N-121	Salt River Basin	Plum Creek at Waterford, Kentucky	32	1,460	7
N-122	Green River Basin	Green River at Munfordville, Ky.	1,493	370	11

TABLE 1 (continued)

Land Resource Area	Sub-Basin	Station	Discharge Area (Sq.Miles)	Average Annual Yield	Number of Years
N-122	Green River Basin	Barren River at Bowling Green, Kentucky	1,358	240	7
N-120	Green River Basin	Rough River at Falls of Rough Kentucky	500	370	4
N-120	Tradewater River Basin	Tradewater River at Olney, Kentucky	246	69	10

Table 2. SUMMARY of RESERVOIR SEDIMENTATION SURVEYS MADE in the OHIO RIVER BASIN THROUGH 1980

RESERVOIR	STREAM	NEAREST TOWN	DRAINAGE AREA IN SQUARE MILES: TOTAL	DRAINAGE AREA IN SQUARE MILES: NET	DATE OF SURVEY		PERIOD BETWEEN SURVEYS IN YEARS	STORAGE CAPACITY IN ACRE-FT.	CAPACITY WATERSHED RATIO IN ACRE-FT. PER SQ. MI.	SPECIFIC WEIGHT (DRY) IN LBS. PER CU. FT.	AVERAGE ANNUAL SEDIMENT ACCUMULATION PER SQ. MI. FOR PERIOD: AC. FT.	AVERAGE ANNUAL SEDIMENT ACCUMULATION PER SQ. MI. FOR PERIOD: TONS
Huntingburg (Upper)	Trib. of Patoka River	Huntingburg, Ind.	0.670	0.630	July	1934	--	137.000	204.00	--	--	--
Huntingburg (Upper)	Trib. of Patoka River	Huntingburg, Ind.	--	--	Oct.	1960	26.30	119.000	178.00	*60.000	0.6170	538.000
Oakland City No. 2	S. Fork Patoka River	Oakland City, Ind.	0.560	0.540	--	1941	--	1,085.000	1,898.00	--	--	--
Oakland City No. 2	S. Fork Patoka River	Oakland City, Ind.	--	--	Sept.	1960	19.00	1,010.000	1,870.00	*60.000	1.9700	1,720.000
Shafer Lake	Tippecanoe River	Monticello, Ind.	1,700.000	1,698.000	June	1923	--	14,722.000	8.66	--	--	--
Shafer Lake	Tippecanoe River	Monticello, Ind.	--	--	Aug.	1960	37.20	14,041.000	8.26	*75.000	0.0230	38.000
Spring Mill	Mill Creek	Mitchell, Ind.	15.030	5.290	Oct.	1938	--	178.000	11.80	--	--	--
Spring Mill	Mill Creek	Mitchell, Ind.	--	--	Sept.	1948	9.90	127.000	8.40	*67.000	0.9750	1,420.000
[illegible] Lake	Conner's Branch	[illegible], Ill.	25.100	25.000	Aug.	1947	--	306.000	12.20	--	--	--
[illegible] Lake	Conner's Branch	[illegible], Ill.	--	--	Sept.	1960	13.10	260.000	10.40	*70.000	0.1400	213.000
Ridge Lake	Trib. of Embarrass River	Charleston, Ill.	1.410	1.380	Apr.	1941	--	187.400	133.00	--	--	--
Ridge Lake	Trib. of Embarrass River	Charleston, Ill.	--	--	Sept.	1947	6.40	171.900	122.00	72.400	1.7900	2,780.000
Vermillion Lake	N. Fork Vermillion River	Danville, Ill.	267.000	266.000	June	1925	--	8,643.000	32.40	--	--	--
Vermillion Lake	N. Fork Vermillion River	Danville, Ill.	--	--	Oct.	1960	35.30	7,438.000	27.90	*70.000	0.1790	273.000
[illegible] Park Lake	Trib. of [illegible] Creek	Flora, Ill.	1.360	1.330	--	1938	--	49.080	36.63	--	--	--
[illegible] Park Lake	Trib. of [illegible] Creek	Flora, Ill.	--	--	June	1959	21.00	37.750	28.17	58.400	0.4000	510.900
[illegible] Lake	Trib. of [illegible] Creek	Martinsville, Ill.	0.465	0.427	--	1947	--	187.750	403.80	--	--	--
[illegible] Lake	Trib. of [illegible] Creek	Martinsville, Ill.	--	--	June	1959	12.00	175.180	376.70	33.140	2.4600	1,775.600
[illegible] Lake	None	La Clede, Ill.	0.538	0.531	--	1928	--	16.400	30.48	--	--	--
[illegible] Lake	None	La Clede, Ill.	--	--	Aug.	1958	30.00	13.300	24.72	61.960	0.1900	255.350
[illegible] Lake	Trib. of Veale Creek	Washington, Ind.	0.360	0.330	Aug.	1950	--	106.800	308.00	--	--	--
[illegible] Lake	Trib. of Veale Creek	Washington, Ind.	--	--	Aug.	1956	6.00	106.400	307.00	--	0.2180	--
[illegible]	[illegible] Creek	[illegible], Ill.	3.353	3.199	--	1926	--	607.670	230.00	--	--	--
[illegible]	[illegible] Creek	[illegible], Ill.	--	--	June	1960	34.00	609.700	181.64	43.500	0.9540	53.700
Jones Pond	Trib. of Flat Creek	Odell, Ind.	0.034	0.031	Oct.	1954	--	10.700	314.00	--	--	--
Jones Pond	Trib. of Flat Creek	Odell, Ind.	--	--	Apr.	1956	1.50	10.600	312.00	--	2.1000	--
Olney Reservoir (New)	Trib. of East Fork	Olney, Ill.	3.360	3.190	Sept.	1954	--	1,555.300	463.00	--	--	--
Olney Reservoir (New)	Trib. of East Fork	Olney, Ill.	--	--	Aug.	1960	6.90	1,517.400	451.00	30.300	1.7000	112.000
[illegible] Lake	Trib. of [illegible] Creek	Edgewood, Ill.	0.959	0.912	--	1926	--	316.750	330.30	--	--	--
[illegible] Lake	Trib. of [illegible] Creek	Edgewood, Ill.	--	--	July	1959	33.00	281.090	293.10	48.940	1.1400	1,267.900
Plum Creek No. 15	Little Plum Creek	Taylorsville, Ky.	1.030	1.020	Sept.	1956	--	224.300	218.00	--	--	--
Plum Creek No. 15	Little Plum Creek	Taylorsville, Ky.	--	--	Apr.	1959	2.50	219.600	213.00	45.000	1.8700	2,030.000
Plum Creek No. 15	Little Plum Creek	Taylorsville, Ky.	--	--	Oct.	1960	1.50	213.200	207.00	53.000	4.1200	3,890.000
Plum Creek No. 17	Trib. of Little Plum Creek	Taylorsville, Ky.	0.560	0.550	Dec.	1956	--	125.300	225.00	--	--	--
Plum Creek No. 17	Trib. of Little Plum Creek	Taylorsville, Ky.	--	--	Apr.	1959	2.33	123.750	221.00	55.000	2.0000	2,439.000
Plum Creek No. 17	Trib. of Little Plum Creek	Taylorsville, Ky.	--	--	Oct.	1960	1.50	121.800	215.00	47.000	3.1100	3,180.000
[illegible] Lake	Trib. of Pond Creek	Fairfield, Ill.	0.308	0.295	--	1945	--	53.680	174.29	--	--	--
[illegible] Lake	Trib. of Pond Creek	Fairfield, Ill.	--	--	June	1960	15.00	48.680	157.86	41.300	1.1900	1,034.300
[illegible] Lake	Trib. of Kettering Branch	Martinsville, Ill.	0.342	0.327	--	1950	--	52.130	152.40	--	--	--
[illegible] Lake	Trib. of Kettering Branch	Martinsville, Ill.	--	--	June	1959	9.00	46.900	136.00	48.000	1.8900	1,975.900
[illegible] Park Lake	Range Creek	Greenup, Ill.	0.294	0.278	--	1906	--	67.410	229.30	--	--	--
[illegible] Park Lake	Range Creek	Greenup, Ill.	--	--	June	1959	53.00	54.900	185.40	47.630	0.0790	932.100
Lake Placid	Unnamed Stream	Lancaster, Ky.	0.200	0.200	Oct.	1902	--	114.000	570.00	--	--	--
Lake Placid	Unnamed Stream	Lancaster, Ky.	--	--	Sept.	1961	58.90	95.000	475.00	--	2.5000	--
Radford	Little River	Radford, Va.	329.000	329.000	Aug.	1934	--	1,646.000	5.00	--	--	--
Radford	Little River	Radford, Va.	--	--	July	1944	10.00	1,018.000	3.09	*70.000	0.1910	291.000
Englewood	Stillwater River	Dayton, Ohio	651.000	639.000	--	1927	--	312,000.000	479.00	--	--	--
Englewood	Stillwater River	Dayton, Ohio	--	--	--	1942	15.00	311,648.000	479.00	77.920	0.0330	63.000
Germantown	Twin Creek	Germantown, Ohio	270.000	264.000	--	1927	--	106,000.000	393.00	--	--	--
Germantown	Twin Creek	Germantown, Ohio	--	--	--	1942	15.00	105,618.000	391.00	79.500	0.0970	154.000
Griggs	Scioto River	Columbus, Ohio	1,053.000	1,052.000	--	1905	--	4,563.000	4.33	--	--	--
Griggs	Scioto River	Columbus, Ohio	--	--	--	1935	30.00	3,920.000	3.72	*65.000	0.0200	28.300
Griggs	Scioto River	Columbus, Ohio	--	--	--	1951	16.00	3,920.000	3.73	59.420	--	--
Ohio Cons. Pond No. 73	Blacklick Creek	Columbus, Ohio	24.000	24.000	Nov.	1936	--	4.680	0.20	--	--	--
Ohio Cons. Pond No. 73	Blacklick Creek	Columbus, Ohio	--	--	June	1939	2.60	2.530	0.11	--	0.0350	--
Ohio Cons. Pond No. 74	Blacklick Creek	Columbus, Ohio	23.000	23.000	Jan.	1937	--	1.040	0.05	--	--	--
Ohio Cons. Pond No. 74	Blacklick Creek	Columbus, Ohio	--	--	Nov.	1939	2.80	0.580	0.03	--	0.0080	--
Lake White	Pee Pee Creek	Waverly, Ohio	37.400	36.900	Oct.	1935	--	3,734.000	99.80	--	--	--
Lake White	Pee Pee Creek	Waverly, Ohio	--	--	Dec.	1947	12.00	3,338.000	89.30	--	0.8540	--
Lake White	Pee Pee Creek	Waverly, Ohio	--	--	Aug.	1951	4.00	3,706.000	99.10	48.000	1.7300	--
Herrington Lake	Dix River	Harrodsburg, Ky.	437.000	431.000	Oct.	1925	--	258,969.000	593.00	--	--	--
Herrington Lake	Dix River	Harrodsburg, Ky.	--	--	Oct.	1941	16.00	255,706.000	585.00	--	0.4710	--
Walton	Bank Lick Creek	Walton, Ky.	0.250	0.240	--	1931	--	128.000	512.00	--	--	--
Walton	Bank Lick Creek	Walton, Ky.	--	--	--	1937	6.00	122.000	488.00	*80.000	4.4600	4,840.000
Williamstown	Grassy Creek	Williamstown, Ky.	0.470	0.470	--	1930	--	113.000	240.00	--	--	--
Williamstown	Grassy Creek	Williamstown, Ky.	--	--	--	1937	7.00	106.000	226.00	--	2.1300	--
Byllesby	New River	Byllesby, Va.	1,310.000	1,310.000	Aug.	1912	--	8,892.000	6.79	--	--	--
Byllesby	New River	Byllesby, Va.	--	--	May	1936	23.66	3,538.000	2.70	--	0.1840	--
O'Shaughnessy	Scioto River	Dublin, Ohio	980.000	987.000	Fall	1925	--	16,673.000	16.93	--	--	--
O'Shaughnessy	Scioto River	Dublin, Ohio	--	--		1934	9.00	15,604.000	15.80	*65.000	0.1210	171.000
O'Shaughnessy	Scioto River	Dublin, Ohio	--	--		1942	8.00	14,538.000	14.70	*65.000	0.1350	191.000
O'Shaughnessy	Scioto River	Dublin, Ohio	--	--	July	1951	9.00	14,162.000	14.30	44.200	0.0430	40.900
[illegible] Lake	Patterson Run	Piqua, Ohio	2.330	2.300	--	1940	--	115.000	49.00	--	--	--
[illegible] Lake	Patterson Run	Piqua, Ohio	--	--	June	1950	10.00	84.000	36.00	51.010	0.9130	1,032.000
Madison Lake	Deer Creek	London, Ohio	57.290	57.000	--	1945	--	594.000	10.40	--	--	--
Madison Lake	Deer Creek	London, Ohio	--	--	June	1949	3.60	530.200	9.30	49.200	0.4300	499.000
Madison Lake	Deer Creek	London, Ohio	--	--	June	1951	2.00	511.000	9.00	45.950	0.1790	79.000
Madison Lake	Deer Creek	London, Ohio	--	--	June	1954	3.00	496.790	8.90	40.990	0.1600	42.300
Grant Lake	Sterling Run	Mt. Orab, Ohio	25.250	24.960	Dec.	1948	--	1,190.000	47.00	--	--	--
Grant Lake	Sterling Run	Mt. Orab, Ohio	--	--	July	1950	1.60	1,141.000	46.00	86.400	0.7220	1,361.000
Caldwell Lake	Trib. of Stony Creek	Waverly, Ohio	1.020	1.030	--	1937	--	88.000	86.00	--	--	--
Caldwell Lake	Trib. of Stony Creek	Waverly, Ohio	--	--	Sept.	1949	12.00	85.000	83.00	*60.000	0.2530	331.000
Stewart Lake	Trib. of Stony Creek	Chillicothe, Ohio	0.310	0.300	--	1939	--	74.000	239.00	--	--	--

* Estimated or Assumed

Reproduced from best available copy.

Table 2. (Continued)

RESERVOIR	STREAM	NEAREST TOWN	DRAINAGE AREA IN SQUARE MILES: TOTAL	NET	DATE OF SURVEY		PERIOD BETWEEN SURVEYS IN YEARS	STORAGE CAPACITY IN ACRE-FT.	CAPACITY WATERSHED RATIO IN ACRE-FT. PER SQ. MI.	SPECIFIC WEIGHT (DRY) IN LBS. PER CU. FT.	AVERAGE ANNUAL SEDIMENT ACCUMULATION PER SQ. MI. FOR PERIOD: AC. FT.	TONS
Stewart Lake	Trib. of Story Creek	Chillicothe, Ohio	--	--	Sept.	1951	12.30	71.000	289.00	*60.000	0.8700	1,137.000
Pine Lake	Tar Hollow Creek	Gillespieville, Ohio	2.420	2.400	--	1938	--	136.000	55.00	--	--	--
Pine Lake	Tar Hollow Creek	Gillespieville, Ohio	--	--	Aug.	1950	11.70	123.000	51.00	60.970	0.3000	995.000
Kiser Lake	Mosquito Creek	St. Paris, Ohio	8.730	8.110	Jan.	1940	--	3,331.000	382.00	--	--	--
Kiser Lake	Mosquito Creek	St. Paris, Ohio	--	--	Jan.	1950	10.90	3,126.000	358.00	*50.000	2.1070	2,514.000
Kiser Lake	Mosquito Creek	St. Paris, Ohio	--	--	--	1954	4.00	3,060.000	348.00	39.700	2.9400	2,283.000
Eversole Run (Trib. arm of O'Shaughnessy Res.)	Eversole Run	Dublin, Ohio	13.800	13.700	--	1925	--	314.000	23.00	--	--	--
Eversole Run (Trib. arm of O'Shaughnessy Res.)	Eversole Run	Dublin, Ohio	--	--	--	1951	26.00	295.000	22.00	55.900	0.2500	302.000
Allen Lake	Trib. of Silver Creek	Kenton, Ohio	0.500	0.500	--	1938	--	12.000	24.00	--	--	--
Allen Lake	Trib. of Silver Creek	Kenton, Ohio	--	--	Aug.	1951	13.00	10.000	20.00	52.600	0.3600	398.000
Sylvan Lake (Lower)	Trib. of Beaver Creek	Vienna, Ohio	1.850	1.390	--	1947	--	275.000	149.00	--	--	--
Sylvan Lake (Lower)	Trib. of Beaver Creek	Vienna, Ohio	--	--	Aug.	1951	3.80	261.000	141.00	44.800	2.7300	2,664.000
Sylvan Lake (Upper)	Trib. of Beaver Creek	Vienna, Ohio	0.400	0.380	--	1948	--	63.000	158.00	--	--	--
Sylvan Lake (Upper)	Trib. of Beaver Creek	Vienna, Ohio	--	--	Aug.	1951	2.80	59.000	147.00	*65.000	3.5300	3,460.000
Westerman Lake	Trib. of Mad River	Springfield, Ohio	1.590	1.580	Nov.	1938	--	83.000	52.00	--	--	--
Westerman Lake	Trib. of Mad River	Springfield, Ohio	--	--	Aug.	1951	12.70	75.000	47.00	66.200	0.3800	348.000
Reynolds Pond	Trib. of [illegible] Creek	Bidwell, Ohio	0.700	0.700	--	1940	--	18.000	26.00	--	--	--
Reynolds Pond	Trib. of [illegible] Creek	Bidwell, Ohio	--	--	Aug.	1950	10.00	15.300	21.00	57.400	0.4410	551.000
Mt. Gilead Lake (Upper)	Dunn Creek	Mt. Gilead, Ohio	8.550	5.590	--	1930	--	20.000	3.27	--	--	--
Mt. Gilead Lake (Upper)	Dunn Creek	Mt. Gilead, Ohio	--	--	Oct.	1948	18.00	14.000	2.51	*60.000	0.0390	51.000
Schmidt Pond	Trib. of Big Walnut Creek	Westerville, Ohio	0.820	0.820	--	1921	--	7.300	9.00	--	--	--
Schmidt Pond	Trib. of Big Walnut Creek	Westerville, Ohio	--	--	Aug.	1951	30.00	4.800	6.00	57.100	0.1000	124.000
Lake Alma	Trib. of Raccoon Creek	Wellston, Ohio	0.810	0.700	--	1901	--	774.000	956.00	--	--	--
Lake Alma	Trib. of Raccoon Creek	Wellston, Ohio	--	--	Sept.	1951	50.00	774.000	919.00	55.500	0.8600	1,015.000
Maple Grove Lake	Dunn Creek	Mt. Gilead, Ohio	3.050	3.040	--	1932	--	28.100	9.21	--	--	--
Maple Grove Lake	Dunn Creek	Mt. Gilead, Ohio	--	--	Sept.	1949	17.00	23.900	7.84	83.200	0.0790	143.000
Pond Lick Lake	Pond Lick Run	Friendship, Ohio	2.540	2.530	--	1938	--	48.000	19.00	--	--	--
Pond Lick Lake	Pond Lick Run	Friendship, Ohio	--	--	July	1950	12.30	39.000	15.00	58.800	0.2770	355.000
Wolfden Lake	Wolfden Run	Friendship, Ohio	0.600	0.600	--	1936	--	25.400	42.30	--	--	--
Wolfden Lake	Wolfden Run	Friendship, Ohio	--	--	July	1950	14.30	23.100	38.50	59.980	0.2780	355.000
Bear Lake	Left Fork Bear Creek	Friendship, Ohio	0.480	0.470	--	1937	--	33.000	68.80	--	--	--
Bear Lake	Left Fork Bear Creek	Friendship, Ohio	--	--	July	1950	15.30	32.000	66.60	67.080	0.1960	203.000
McBride Lake	Trib. of Pond Run	Friendship, Ohio	0.610	0.610	--	1937	--	13.000	21.30	--	--	--
McBride Lake	Trib. of Pond Run	Friendship, Ohio	--	--	July	1950	13.30	11.000	18.00	36.010	0.2250	167.000
Roosevelt Lake	Turkey Creek	Friendship, Ohio	16.380	15.960	--	1935	--	101.000	6.17	--	--	--
Roosevelt Lake	Turkey Creek	Friendship, Ohio	--	--	July	1950	15.30	67.000	4.09	61.000	0.1400	186.000
Adams Lake	Lick Creek	West Union, Ohio	4.490	4.390	--	1947	--	318.000	71.00	--	--	--
Adams Lake	Lick Creek	West Union, Ohio	--	--	July	1950	3.50	306.000	68.60	53.240	0.8950	1,038.000
Vesuvius Lake	Storms Creek	Ironton, Ohio	10.900	10.700	--	1937	--	1,553.000	142.00	--	--	--
Vesuvius Lake	Storms Creek	Ironton, Ohio	--	--	June	1949	12.00	1,463.000	136.00	*54.000	0.4970	580.000
Vesuvius Lake	Storms Creek	Ironton, Ohio	--	--	July	1952	3.00	1,463.000	136.00	54.000	0.0190	22.000
Pike Lake	Richardson Hollow of Morgan Fork	Bainbridge, Ohio	3.440	3.420	--	1937	--	91.400	27.00	--	--	--
Pike Lake	Richardson Hollow of Morgan Fork	Bainbridge, Ohio	--	--	Aug.	1950	13.00	86.500	25.00	40.800	0.1100	96.300
Upper Hocking No. 2	Hunters Run	Lancaster, Ohio	1.870	1.870	Apr.	1956	--	56.980	30.47	--	--	--
Upper Hocking No. 2	Hunters Run	Lancaster, Ohio	--	--	June	1961	5.00	51.080	27.28	68.237	0.6370	946.711
Jackson Lake	Black Fork River	Oak Hill, Ohio	18.800	18.400	--	1940	--	*1,700.000	90.00	--	--	--
Jackson Lake	Black Fork River	Oak Hill, Ohio	--	--	--	1951	11.00	*1,590.000	84.00	*60.000	0.5400	705.000
Loramie Lake	Loramie Creek	Ft. Loramie, Ohio	78.700	77.600	--	1940	--	4,115.000	52.09	--	--	--
Loramie Lake	Loramie Creek	Ft. Loramie, Ohio	--	--	--	1960	20.00	3,115.000	39.60	*65.00	0.1300	156.000
Sharon Woods Reservoir	Sharon Creek	Sharonville, Ohio	4.880	4.880	--	1937	--	289.000	59.22	--	--	--
Sharon Woods Reservoir	Sharon Creek	Sharonville, Ohio	--	--	--	1942	8.30	271.900	56.33	*70.00	1.2700	1,936.000
Sharon Woods Reservoir	Sharon Creek	Sharonville, Ohio	--	--	--	1945	3.60	232.500	47.64	*70.00	2.4400	3,036.000
Sharon Woods Reservoir	Sharon Creek	Sharonville, Ohio	--	--	--	1949	4.00	206.500	42.32	*70.00	1.3800	2,653.000
Cowan Lake	Cowan Creek	Wilmington, Ohio	49.400	48.900	--	1947	--	13,305.000	268.00	--	--	--
Cowan Lake	Cowan Creek	Wilmington, Ohio	--	--	--	1960	13.00	12,770.000	257.00	*50.00	0.8470	923.000
Hargus Lake	Hargus Creek	Circleville, Ohio	6.600	6.600	--	1956	--	2,926.000	443.00	--	--	--
Hargus Lake	Hargus Creek	Circleville, Ohio	--	--	--	1960	4.00	2,892.000	438.00	*50.000	1.3300	1,690.000
Hillsboro	Trib. of Clear Creek	Hillsboro, Ohio	0.730	0.690	--	1945	--	279.900	384.00	--	--	--
Hillsboro	Trib. of Clear Creek	Hillsboro, Ohio	--	--	--	1955	9.00	271.400	372.00	*60.000	1.3500	1,190.000
Delaware	Olentangy River	Delaware, Ohio	381.000	379.000	Mar.	1951	--	132,000.000	346.00	--	--	--
Delaware	Olentangy River	Delaware, Ohio	--	--	May	1960	9.25	131,483.000	345.00	*65.000	0.1675	258.000
Pleasant Hill	Clear Fork	Perrysville, Ohio	199.000	195.000	Oct.	1938	--	87,000.000	441.00	--	--	--
Pleasant Hill	Clear Fork	Perrysville, Ohio	--	--	Feb.	1945	6.25	87,424.000	439.00	*65.000	0.2270	321.000
Senecaville	Seneca Fork	Senecaville, Ohio	121.000	113.000	Oct.	1936	--	88,500.000	731.00	--	--	--
Senecaville	Seneca Fork	Senecaville, Ohio	--	--	Mar.	1945	8.30	87,667.000	725.00	*65.000	0.8900	1,260.000
Charles Mill	Black Fork, Mohican River	Mansfield, Ohio	216.000	207.000	June	1938	--	88,000.000	407.00	--	--	--
Charles Mill	Black Fork, Mohican River	Mansfield, Ohio	--	--	Sept.	1946	8.25	85,886.000	397.00	*65.000	1.2400	1,755.000
Charles Mill	Black Fork, Mohican River	Mansfield, Ohio	--	--	July	1954	7.75	85,483.000	396.00	*65.000	0.2530	358.000
Hinckston Run	Hinckston Run	Johnstown, Pa.	10.750	10.750	--	1925	--	3,453.000	321.00	--	--	--
Hinckston Run	Hinckston Run	Johnstown, Pa.	--	--	Sept.	1937	12.00	3,315.000	308.00	*60.000	0.4080	533.000
Quemahoning	Quemahoning Creek	Johnstown, Pa.	92.000	90.700	Jan.	1912	--	35,295.000	384.00	--	--	--
Quemahoning	Quemahoning Creek	Johnstown, Pa.	--	--	Sept.	1937	25.80	34,413.000	374.00	--	0.3770	--
Salt Lick	Salt Lick Run	Johnstown, Pa.	11.860	11.760	--	1914	--	2,492.000	210.00	--	--	--
Salt Lick	Salt Lick Run	Johnstown, Pa.	--	--	Sept.	1937	23.00	2,432.000	205.00	*60.000	0.2270	[illegible]
Bridgeport (Upper)	Jacobs Creek	Mt. Pleasant, Pa.	38.500	38.380	Mar.	1887	--	612.000	16.00	--	--	--
Bridgeport (Upper)	Jacobs Creek	Mt. Pleasant, Pa.	--	--	Nov.	1937	50.50	453.000	11.80	--	0.2890	--
Barberton	Wolf Creek	Barberton, Ohio	28.200	28.000	--	1925	--	2,054.000	72.90	--	--	--
Barberton	Wolf Creek	Barberton, Ohio	--	--	Dec.	1938	12.00	1,688.000	59.90	*65.000	1.1000	1,120.000
Buckeye Lake	S. Fork Licking River	Millersport, Ohio	49.200	45.100	--	1832	--	19,940.000	405.00	--	--	--
Buckeye Lake	S. Fork Licking River	Millersport, Ohio	--	--	July	1939	107.00	15,790.000	321.00	*65.000	0.4400	937.000
Leesville	McGuire Creek	Leesville, Ohio	48.000	45.700	Aug.	1936	--	37,600.000	779.00	--	--	--
Leesville	McGuire Creek	Leesville, Ohio	--	--	Nov.	1939	3.30	37,380.000	774.00	*57.000	0.0420	73.300

* Estimated or Assumed

Table 2. (Continued)

RESERVOIR	STREAM	NEAREST TOWN	DRAINAGE AREA IN SQUARE MILES TOTAL	DRAINAGE AREA IN SQUARE MILES WET	DATE OF SURVEY		PERIOD BETWEEN SURVEYS IN YEARS	STORAGE CAPACITY IN ACRE-FT.	CAPACITY WATERSHED RATIO IN ACRE-FT. PER SQ. MI.	SPECIFIC WEIGHT (DRY) IN LBS. PER CU. FT.	AVERAGE ANNUAL SEDIMENT ACCUMULATION PER SQ. MI. FOR PERIOD AC. FT.	TONS
Muskingum College	Trib. of Muskingum River	New Concord, Ohio	0.320	0.310	--	1915	--	9.600	29.60	--	--	--
Muskingum College	Trib. of Muskingum River	New Concord, Ohio	--	--	Nov.	1935	20.00	7.000	22.00	*70.000	0.3810	581.000
Ohio Conc. Pond No. 22	Trib. of Duck Creek	Marietta, Ohio	0.050	0.050	Oct.	1938	--	4.430	88.60	--	--	--
Ohio Conc. Pond No. 22	Trib. of Duck Creek	Marietta, Ohio	--	--	Nov.	1939	1.10	4.710	94.20	*40.000	4.0000	3,485.000
Ohio Conc. Pond No. 51	Trib. of Ohio River	Marietta, Ohio	0.130	0.130	Oct.	1938	--	15.140	117.00	--	--	--
Ohio Conc. Pond No. 51	Trib. of Ohio River	Marietta, Ohio	--	--	Nov.	1939	1.10	15.020	116.00	*40.000	0.9770	851.000
Ohio Conc. Pond No. 52	Trib. of Ohio River	Marietta, Ohio	0.170	0.160	--	1938	--	17.950	106.00	--	--	--
Ohio Conc. Pond No. 52	Trib. of Ohio River	Marietta, Ohio	--	--	Nov.	1939	1.00	15.400	90.60	*50.000	1.4500	1,579.000
Robins Lake	Fork Creek	Hartford, Ohio	4.470	4.450	--	1922	--	91.620	20.50	--	--	--
Robins Lake	Fork Creek	Hartford, Ohio	--	--	Dec.	1939	17.40	79.900	18.00	*48.000	0.1510	226.000
Garlays Lake	Trib. of Youghiogheny River	Dutontown, Pa.	3.000	2.970	--	1908	--	150.000	50.00	--	--	--
Garlays Lake	Trib. of Youghiogheny River	Dutontown, Pa.	--	--	June	1939	30.00	138.000	46.00	*60.000	0.1350	196.000
Stony Lake	McMahre Creek	Perryville, Ohio	11.790	11.720	--	1927	--	121.000	10.30	--	--	--
Stony Lake	McMahre Creek	Perryville, Ohio	--	--	Dec.	1938	11.00	80.000	6.81	*65.000	0.3190	452.000
Stony Lake	McMahre Creek	Perryville, Ohio	--	--	May	1949	10.40	61.000	5.19	*65.000	0.3560	221.000
Tabor Club Lake	Small Br. Muskingum River	Perryville, Ohio	0.550	0.540	--	1923	--	53.600	97.50	--	--	--
Tabor Club Lake	Small Br. Muskingum River	Perryville, Ohio	--	--	Dec.	1938	15.00	42.400	77.10	*80.000	1.3800	1,500.000
Zanesville Nursery L	N. Br. Mount Run	Zanesville, Ohio	2.950	2.930	Dec.	1936	--	75.620	26.00	--	--	--
Zanesville Nursery L	N. Br. Mount Run	Zanesville, Ohio	--	--	July	1941	4.60	72.730	24.90	*65.000	0.1960	462.000
Tionesta	Tionesta Creek	Tionesta, Pa.	470.000	470.000	Feb.	1941	--	133,400.000	279.00	--	--	--
Tionesta	Tionesta Creek	Tionesta, Pa.	--	--	Sept.	1949	8.60	132,571.000	279.00	*65.000	0.8930	287.000
Loyalhanna	Loyalhanna Creek	Saltsburg, Pa.	290.000	285.000	June	1942	--	95,300.000	329.00	--	--	--
Loyalhanna	Loyalhanna Creek	Saltsburg, Pa.	--	--	Oct.	1948	6.33	94,607.000	326.00	*46.000	0.3830	367.000
Loyalhanna	Loyalhanna Creek	Saltsburg, Pa.	--	--	Sept.	1953	4.92	93,155.000	321.00	*46.000	0.5070	582.000
Mahoning Creek	Mahoning Creek	Dayton, Pa.	340.000	336.000	June	1941	--	74,200.000	218.00	--	--	--
Mahoning Creek	Mahoning Creek	Dayton, Pa.	--	--	Aug.	1948	7.30	73,807.000	217.00	*65.000	0.1400	227.000
Crooked Creek	Crooked Creek	Ford City, Pa.	277.000	276.000	Apr.	1940	--	93,900.000	339.00	--	--	--
Crooked Creek	Crooked Creek	Ford City, Pa.	--	--	Sept.	1945	5.40	93,808.000	339.00	*65.000	0.0680	67.000
Tygart River	Tygart River	Grafton, W. Va.	1,186.000	1,179.000	Oct.	1937	--	289,500.000	245.00	--	--	--
Tygart River	Tygart River	Grafton, W. Va.	--	--	Feb.	1945	--	--	--	--	--	--
Tygart River	Tygart River	Grafton, W. Va.	--	--	Mar.	1959	21.98	287,700.000	243.00	*65.000	0.0750	106.000
Youghiogheny River	Youghiogheny River	Confluence, Pa.	434.000	428.000	Oct.	1943	--	292,000.000	525.00	--	--	--
Youghiogheny River	Youghiogheny River	Confluence, Pa.	--	--	Oct.	1949	6.00	253,121.000	583.00	*65.000	0.3410	483.000
Atwood Reservoir	Indian Fk., Cassitten Creek	Sherrodsville, Ohio	70.000	66.800	Apr.	1940	--	49,700.000	710.00	--	--	--
Atwood Reservoir	Indian Fk., Cassitten Creek	Sherrodsville, Ohio	--	--	Dec.	1946	6.70	49,570.000	708.00	*65.000	0.2900	420.000
Lake Rope	Sandy Run	Salesol, Ohio	9.950	9.760	May	1939	--	1,500.000	151.00	--	--	--
Lake Rope	Sandy Run	Salesol, Ohio	--	--	July	1949	10.20	1,468.000	147.00	74.800	0.4420	72.000
Jefferson Lake	Town Fk. Yellow River	Richmond, Ohio	7.520	7.480	Dec.	1935	--	189.000	25.00	--	--	--
Jefferson Lake	Town Fk. Yellow River	Richmond, Ohio	--	--	Aug.	1950	14.70	195.000	21.00	37.900	0.3000	247.000
Clinton Lake	Ctr. Br. Rush Creek	Somerset, Ohio	8.700	8.660	--	1948	--	236.000	27.00	--	--	--
Clinton Lake	Ctr. Br. Rush Creek	Somerset, Ohio	--	--	--	1949	1.40	236.000	27.00	55.700	1.4500	1,480.000
Clinton Lake	Ctr. Br. Rush Creek	Somerset, Ohio	--	--	--	1950	1.00	205.000	24.00	50.600	1.2700	1,273.000
Clinton Lake	Ctr. Br. Rush Creek	Somerset, Ohio	--	--	--	1951	1.00	272.000	31.00	53.000	0.4400	676.700
Clinton Lake	Ctr. Br. Rush Creek	Somerset, Ohio	--	--	--	1952	1.00	199.000	23.00	55.600	0.3400	619.000
Clinton Lake	Ctr. Br. Rush Creek	Somerset, Ohio	--	--	--	1953	1.00	197.000	23.00	65.300	0.7500	1,212.000
Clinton Lake	Ctr. Br. Rush Creek	Somerset, Ohio	--	--	--	1954	1.00	193.000	22.00	68.800	0.4100	885.000
Uniontville, Lake	Trib. of Mahoning River	Alliance, Ohio	8.360	8.290	--	1913	--	996.000	119.00	--	--	--
Uniontville, Lake	Trib. of Mahoning River	Alliance, Ohio	--	--	Aug.	1950	37.00	933.000	112.00	66.000	0.2000	287.000
Berlin	Mahoning River	Berlin Center, Ohio	249.000	246.000	July	1943	--	--	--	--	--	--
Berlin	Mahoning River	Berlin Center, Ohio	--	--	Nov.	1951	8.40	91,200.000	366.00	*100.000	1.3000	2,830.000
Meadows Lake	Broad Ford Run	Mt. Lake Park, Md.	7.400	7.400	--	1880	--	127.750	19.20	--	--	--
Meadows Lake	Broad Ford Run	Mt. Lake Park, Md.	--	--	July	1957	76.00	97.020	13.10	--	0.0820	--
Skinner Lake	Trib. of Sandy Creek	Minerva, Ohio	0.070	0.070	--	1931	--	0.190	2.00	--	--	--
Skinner Lake	Trib. of Sandy Creek	Minerva, Ohio	--	--	--	1938	7.00	0.000	0.00	*65.000	0.8900	410.000
Reuben Lake	Trib. of Sandy Creek	Minerva, Ohio	0.120	0.120	--	1930	--	0.110	0.92	--	--	--
Reuben Lake	Trib. of Sandy Creek	Minerva, Ohio	--	--	--	1938	8.00	0.000	0.00	65.000	0.0800	113.000
Buckeye Lake	S. Fk. Licking Creek	Buckeye Lake, Ohio	49.200	45.100	--	1832	--	19,840.000	405.00	--	--	--
Buckeye Lake	S. Fk. Licking Creek	Buckeye Lake, Ohio	--	--	--	1939	107.00	15,790.000	321.00	*60.000	0.8400	936.000
Lake Milton	Mahoning River	Milton, Ohio	280.000	277.400	--	1916	--	28,100.000	100.00	--	--	--
Lake Milton	Mahoning River	Milton, Ohio	--	--	--	1941	25.00	22,250.000	80.00	*65.000	0.8400	1,189.000
Potters Pond	Trib. of Indian Creek	Lancaster, Ohio	0.110	0.110	--	1866	--	9.460	86.00	--	--	--
Potters Pond	Trib. of Indian Creek	Lancaster, Ohio	--	--	--	1954	8.00	9.110	82.80	48.300	0.3600	377.000
Wyandot Lake	Trib. of Clear Creek	Logan, Ohio	0.580	0.580	--	1930	--	11.500	19.83	--	--	--
Wyandot Lake	Trib. of Clear Creek	Logan, Ohio	--	--	--	1948	18.00	4.650	8.02	--	0.6570	--
Terra Alta Lake	Stony River	Kingwood, W. Va.	4.750	--	--	1902	--	144.800	30.40	--	--	--
Terra Alta Lake	Stony River	Kingwood, W. Va.	--	--	June	1952	50.00	117.300	24.60	*50.000	0.1170	197.000
Meander Creek	Meander Creek	Youngstown, Ohio	84.900	81.760	--	1927	--	32,600.000	382.00	--	--	--
Meander Creek	Meander Creek	Youngstown, Ohio	--	--	--	1949	20.00	31,835.000	375.00	*65.000	0.3640	489.000

* Estimated or Assumed

TABLE 3

COMPARISON OF RESERVOIR SEDIMENTATION RATES IN MAJOR BASINS TRIBUTARY TO THE OHIO RIVER BASIN

BASIN	Number Reservoirs Surveyed in Basin	Annual Sediment Accumulation Per Square Mile (Acre Feet)			
		Average Rates All Reservoirs	Median Rates All Reservoirs	Range in Reservoir Rates	
				Maximum Value	Minimum Value
Allegheny	7	0.28	0.22	0.50	0.06
Beaver	6	1.49	1.07	3.52	0.20
Hocking	4	0.59	0.65	0.69	0.36
Kanawha	2	0.19	0.19	0.19	0.18
Kentucky	2	1.49	1.49	2.50	0.47
Licking	2	3.30	3.30	4.46	2.13
Little Miami	3	0.56	0.72	0.85	0.11
Miami	9	1.28	1.27	2.64	0.04
Monongahela	4	0.11	0.11	0.14	0.08
Muskingum	16	0.54	0.31	1.38	0.07
Scioto	16	0.41	0.16	1.73	0.02
Wabash	17	1.02	0.92	2.46	0.02

TABLE 4

Annual Sediment Accumulation Per Square Mile in Acre Feet	Reservoir Rating
Above 1.00	High
Between 0.50 and 1.00	Moderate
Below 0.50	Low

The evaluations of the basins named above are tentative since the number of reservoirs surveyed in many of the basins is too few for a valid statistical analysis. An average annual sedimentation rate of 2.78 acre feet per square mile was calculated for two small reservoirs in the Salt River basin, but the drainage areas of these reservoirs were so small (1.02 and 0.55 square miles) that the data for them are not included in Table 3.

Unfortunately, little or no reservoir sediment data were available for the Big Sandy and Little Kanawha basins in the upper part of the Ohio River Basin or for the Cumberland, Green, and Tradewater basins in the lower part of the Ohio River Basin. Low yield rates have been reported in the Tradewater for specific locations, however, annual high yields were found at a suspend sediment station in the Salt River basin (2).

In the Ohio River Basin, where extreme variation in precipitation characteristics and other climatic conditions do not occur from one general area to another, land use and topography appear to be the chief factors determining the differences in erosion rates and sedimentation potential among the major sub-basins.

Surveys conducted by the Wheeling Field Station, Ohio River Basin Project, indicate sedimentation as a chief stream pollutant in two of the major sub-basins of the Upper Ohio Basin - the Little Kanawha and the Big Sandy. In the Little Kanawha basin the cause of the relatively high sediment concentrations in some of the major streams is two-fold, poor land use and highly erosive, silty and clayey soils. It is a hilly area, and much of the timber native to the region, which formerly afforded a protective canopy, has been cut away (about 60% of the basin is forested, but much of the woods is of poor quality). Poor farming methods are common to the area, and better soil conservation practices are needed. Some of the land used for cash corps in the recent past currently is being converted to pasture and forest; but overgrazing of hillsides is common, and erosion continues to be a serious problem in the area. Lumbering operations also cause some erosion damage.

Stream sedimentation is severe in two major tributaries (Levisa and Tub Forks) and several minor tributaries of the Big Sandy River. The extensive and acute sedimentation problem in the Big Sandy basin is due primarily to past and present coal mining activities. It is estimated that nearly 40,000 acres of unreclaimed and partically reclaimed strip mine cuts and spoil banks occur in the basin. Extensive amounts of coal fines are discharged into the basin's streams by the numerous coal industries in operation in the area. Many local areas of soil erosion occur due to unprotected access roads and other construction involved in the opening up and operation of numerous small mines in the watershed. Additionally, some erosion results from poor farming methods in parts of this basin of predominately mountainous and hilly terrain.

Unfortunately, no sediment station records were available for the Big Sandy and Little Kanawha basins to assist in the preparation of this report.

Surveys conducted by the Evansville Field Station, Ohio River Basin Project, have shown the occurrence of highly turbid waters in streams throughout the Wabash River basin for days following periods of moderate to heavy runoff due to rainfall. The observations made during the surveys support the sediment accumulation data listed in this report which shows that many of the reservoirs in the Wabash basin have relatively high sediment accumulation rates. Land throughout most of the basin predominately is nearly level to moderately sloping - only a small percent of the basin area is strongly sloping or hilly. Most of the soils, however, are medium to fine textured and slowly permeable. About 75 percent of the basin either is cultivated or in pasture. Consequently, despite an overall topography generally favorable to the retardation of runoff, the potential for erosion in the basin is great in areas under construction and where inadequate conservation is practiced on farmland. According to information obtained from the office of the State Soil Scientist (for Indiana), Soil Conservation Service, U. S. Department of Agriculture, only 35 percent of the farm land in the Wabash basin is under soil conservation practices.

The high sedimentation rates recorded for reservoirs in the Kentucky and Licking basins can be attributed in part to mining operations, partly to logging operations, and in part to poor farming methods on hilly slopes. The relatively high rates recorded for reservoirs in the Beaver and Miami basins compared to the moderate to low rates in the Little Miami and Scioto basins presents an unclear picture. A relatively high erosion potential of many of the soils in the Beaver basin and good land management practices in the Scioto basin suggest a partial answer for the rates obtained in these basins. The comparatively high rates for the Miami basin are somewhat surprising; however land management and soil and topographic conditions in much of the Miami basin are similar to those found in much of the Wabash basin.

The high percent of forest cover in the Allegheny, Kanawha and Monongahela basins plus relatively good land reclamation in many of the strip mined areas are held responsible for the low reservoir sedimentation rates recorded in these basins. It must be emphasized, however, that the amount of sedimentation data is insufficient in most or perhaps all of the basins tributary to the Ohio River Basin to arrive at firm conclusions relative to sediment problems within each of the respective basins. What has been documented is that sedimentation is a problem throughout the Ohio River Basin. In many areas it is not a major problem, but in other areas it is an acute problem, particularly in certain local areas.

The need for more sedimentation data is imperative to a clearer understanding of the overall magnitude of the problem and to pinpoint specific areas where the problem is severe. It is also clear that better land management practices are needed -- recommended soil conservation methods should be more universally applied, strip mining operations and product handling must be improved and land reclamation measures quickly and effectively applied, and logging operations and forestry management designed to control soil erosion must be promoted.

Construction of homes, private and public buildings, roads, and streets in urban and urban fringe areas exposes much soil material annually in the Ohio River Basin and in increasing amounts, generally. This unprotected material erodes rapidly and contributes a considerable amount of sediment to the streams in the basin. The need is very great that builders and developers are encouraged through education, technical assistance, enlightened and enforced regulations, and by other means as necessary to use construction and development practices that minimize the amount of land exposed and length of time it remains inadequately protected during project operations.

Stream sedimentation and reservoir silting are not as great in the Ohio River Basin as compared to some watersheds in western parts of the United States. Sedimentation is a significant problem in the Ohio Basin, however, and one about which too little is known relative to specific areas and to which much more attention and effort must be directed to abate its harmful effects as a pollutant of the basin's streams and reservoirs.

IV. APPENDIX

A. Factors Affecting Sediment Origin, Transportation, and Deposition

Sediment is fragmental material derived mostly from disintegrated rocks and soil which is transported by, suspended in, or deposited by water or air or is accumulated in beds by other natural agencies. Volcanic activity and the disintegration of rocks by earthquakes produce some sediment, but most sediments result from the more gradual disintegration of rocks of the earth's crust. Following weathering and exposure to organic activity at or near the land surface, the rock fragments form soils, and as the unconsolidated particles are eroded by sheet flow or by channel flow, they become fluvial sediment following entrainment in water. Any aeolian sediment that falls on water surfaces as loose particles or in rain drops becomes fluvial sediment.

1. Disintegration of Rocks

Exposed rocks and those near the earth's surface are subjected to various chemical and physical actions working to fragmentize them. Oxidation, carbonation, and hydration are probably the most important chemical processes. Important physical forces include crustal movements, temperature changes of the rocks, freezing and thawing of water in association with rocks, grinding action, impact, and root action.

Rock fragments may range in size from large boulders to colloidal particles. They may have sharp edges and vary widely in shape or may be well rounded by abrasion. They may be cohesionless or cemented together. For uniform nomenclature and terminology, size classifications have been proposed. Table 5 gives the size limits for each class and subclass of a scale recommended by the American Geophysical Union Sub-committee on Sediment Terminology (3).

The size, shape, and mineral composition of the rock particles that become fluvial sediments are important in certain practical stream problems such as the sorption of radioactivity of the particles. Sorption is roughly proportional to the surface area of sediment particles (4). Clay particles, however, tend to be flatter and may have different packing than round grains, and sorption by clays may be due mainly to ion exchange, whereas physical sorption rather than chemical sorption is usual for coarser sediments.

TABLE 5

SCALE OF PARTICLE SIZES, IN METRIC AND ENGLISH UNITS

CLASS AND SUBCLASS	METRIC Millimeters	METRIC Microns	ENGLISH Inches
Boulders			
Very large boulders	4,096-2,048		160-80
Large boulders	2,048-1,024		80-40
Medium boulders	1,024- 512		40-20
Small boulders	512- 256		20-10
Cobbles			
Large cobbles	256- 64		5-2.5
Gravel			
Very coarse gravel	64-32		2.5-1.3
Coarse gravel	32-16		1.3- .6
Medium gravel	16- 8		.6- .3
Fine gravel	8- 4		.3- .16
Very fine gravel	4- 2		.16- .078
Sand			
Very coarse sand	2.000-1.000	2,000-1,000	.078-.039
Coarse sand	1.000- .500	1,000- 500	.039-.020
Medium sand	.500- .250	500- 250	.020-.0098
Find sand	.250- .125	250- 125	.0098-.0049
Very fine sand	.125- .062	125- 62	.0049-.0024
Silt			
Coarse silt	.062- .031	62-31	.0024-.0012
Medium silt	.031- .016	31-16	.0012-.00061
Fine silt	.016- .008	16- 8	.00061-.00030
Very fine silt	.008- .004	8-4	.00030-.00015
Clay			
Coarse clay size	.004-.0021	4-2	.00015-.000076
Medium clay size	.0020-.0010	2-1	.000076-.000038
Fine clay size	.0010-.0005	1-0.5	.000038-.000019
Very fine clay size	.0005-.00024	.5-.24	.000019-.000010

2. Erosion of Unconsolidated Sediments by Water

Sediment loss by water from land surfaces is due to sheet erosion and channel erosion. The rate of sheet erosion is determined by a number of factors related to characteristics of the soil, topography, vegetal cover or land use, and climate. Rates of channel erosion, including gully erosion, are estimated directly or indirectly from characteristics of the flow and channel.

Soil scientists and agricultural engineers have studied extensively the many factors that affect the rate of sheet erosion. Physical characteristics of a soil including particle size and distribution, porosity, permeability, cohesiveness, and antecedent moisture influence the rate of sheet erosion. Vegetation and vegetal litter intercept some rain and reduce the force of raindrops which strike the soil. They help hold the soil in place and reduce the velocity of water flow over the ground. During the growing season, vegetation reduces the soil moisture in the root zone at the beginning of storms, and roots increase the permeability and internal drainage of the soil. In general, the steeper the land slope, the greater and faster the runoff from the land surface. Long slopes also increase flow velocities and sediment removal. The intensity and duration of rainfall, size of raindrops, and wind action influence the rate of erosion. Very small or fine sized particles erode much more easily, generally, and are vastly superior in remaining water suspended than are large or coarse sized particles.

Relations given by Musgrave (5) for computing rates of sheet erosion from small areas can be expressed by the general equation:

$$E = FR_e \left(\frac{P_{30}}{1.25}\right)^{1.75} \left(\frac{S_L}{10}\right)^{1.35} \left(\frac{L}{72}\right)^{0.35}$$

WHERE:

E is the long-time average annual soil loss or rate of sheet erosion in tons per acre or in inches of average depletion:

F is the basic soil erodibility factor, in the same units as E:

R_e is a relative erosion rate for different types of vegetal cover and agricultural practice;

P_{30} is the maximum precipitation, in inches, in a 30-minute period for a recurrence interval of 2 years;

S_L is the average slope of the land surface, in percent; and

L is the length of the slope, in feet, in the direction of flow.

Although the equation has wide usage, it requires modification for different areas and is not precise; but it indicates the significance or principal factors that determine average rates of sheet erosion over a long period of time. Generally, sheet erosion removes the dust and fine soil from the ground surface.

Surface irregularities cause land runoff to concentrate into small streams which increase in size as they join together. Flow from such streams tends to erode channel banks and beds and general channel erosion occurs when the stream flow is able to transport much more of the available sediment than it is already carrying. Most natural streams are relatively well adjusted to the sediment loads they carry, but the release of huge quantities of flow (as from a reservoir) into a channel that has considerable fine sediments readily available in banks and bed may result in significant erosion.

Stream channels tend to erode locally although their flows are in equilibrium with available sediment loads. For example, a winding stream is apt to scour the outside of bends, however much of the eroded sediment, larger particle sizes in particular. may be quickly deposited on the inside of the bends. Gullies, a conspicuous form of channel erosion, are apt to develop on steep slopes where a transitory stream flows over unconsolidated sediments of sand sizes or smaller.

3. Fluvial Transportation of Sediments

The study of sediment transportation by stream flow is complex because many variables are involved, some of which are difficult to express mathematically (except perhaps by curves). Included in the list of variables are the available supply of sediment; size, shape, and density of the particles; channel depths, slopes, and widths; flow velocities; temperature, density, and perhaps chemical composition of the water; and bank roughness and bed configuration. Also measurements such as average particle size or mean velocity may not be meaningful unless the distribution of such factors is known.

Fine particles are transported mostly to entirely in suspension through supporting action of water turbulence and may move without

much deposition. Coarse particles may travel in suspension and also may roll or skip along the stream bed or may undergo transportation alternately by the two methods. In general, the concentrations of both fine and coarse suspended sediments within a stream channel reach increases as flow increases. The concentration increases for fine sediment, however, are much less consistent than those for coarse sediment. The finest sediments move with about the velocity of the flowing water. They may pass directly with the water from the point of erosion to points far downstream (6). Large sediment particles are likely to be deposited temporarily or semipermanently at places along the stream.

4. Deposition

Sediment deposits can be classified into those associated with stream channels, lakes or reservoirs, tidal areas, or flood plains.

Sediment particles are more dense than water and under a given condition of water movement or flow, they tend to settle at rates determined by (1) differences in density between the particles and the water, (2) viscosity of the water, and (3) size, shape, and flocculation of the particles. Thus sediment deposition from streamflows is in accordance with the same physical laws involved in sediment transportation. In essence, sediment deposition is caused either by a general or by a local reduction in transporting ability of streamflow.

As a stream carrying sediment nears a lake or a reservoir, it begins to deposit its coarse sediment as soon as the velocity slows down even slightly (if it was transporting its capacity load of course sediment.) Further slowing of the flow as it approaches the reservoir causes additional deposition, and as the velocity continues to decrease, silt and clay are deposited in appreciable amounts.

Many small reservoirs retard flow sufficiently to trap all incoming coarse sediment and some of the fine sediment. The coarse sediment is deposited as a delta that extends back higher, usually, than the spillway elevation. Also in small reservoirs, fine sediment temporarily deposited may later be flushed away by succeeding flows. The trap efficiency of a reservoir is a function mainly of the fall velocities of the sediment particles and to the degree the water is slowed as it passes through the reservoir (7).

Individual sediment particles may be deposited within a stream channel because of general or local reduction of the stream's transporting ability or because some suspended-sediment particles interchange with particles on the bed although no net deposition occurs.

5. Sediment Records

Although records of sediment discharge in streams in the United States are inadequate for many studies, sufficient information is available to observe that average sediment concentrations differ widely from place to place. Average concentrations are computed from the ratio of sediment discharge to water discharge for a given period.

Figure 1, a generalized map for streams in the United States east of the Mississippi River, shows approximate average concentrations of sediment weighted with water discharge. (West of the Mississippi, streams draining the plains and plateau regions tend to have high to very high sediment concentrations). Sediment concentrations in mountain streams are very low, generally.

B. Land Resource Regions of the Basin 1/

Of the 20 Land Resource Regions of the United States (exclusive of Alaska and Hawaii), portions of five are included in the Ohio River Basin. They are designated as L, Lake States Fruit, Truck, and Dairy Region: M, Central Feed Grains and Livestock Region; N, East and Central General Farming and Forest Region; P, South Atlantic and Gulf Slope Cash Crop, Forest, and Livestock Region; and R, Northeastern Forage and Forest Region. Only small segments of L, P, and R occur within the basin. See Figure 2. East Resource Region is subdivided into Resource Areas. Brief descriptions of the Resource Areas within the basin follow:

L. 98, Southern Michigan Drift Plain

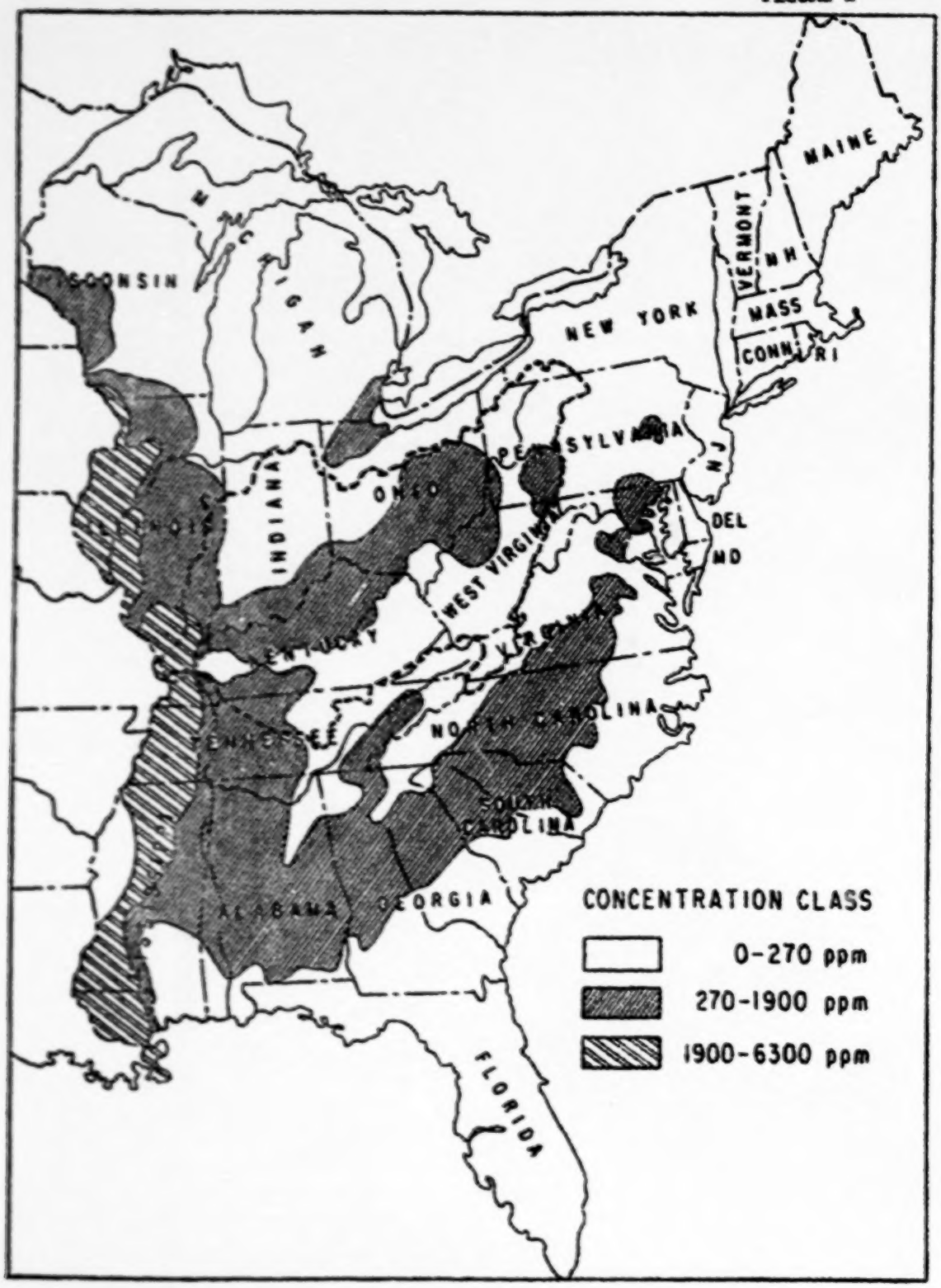
Land Use: Approximately three-fourths of the area is in farms. Much of the remainder is urban, but some is in State forests and parks. Almost one-half of the area is cropped. Less than ten percent of the area is in permanent pasture, and most of the rest of the land in farms is in small woodlots.

Topography: Much of this broad glaciated plain is level to gently rolling with local relief of a few feet to a few tens of feet. Belts of morainic hills have stronger slopes with relief up to 100 to 200 feet.

Climate: Average annual precipitation - 30 to 36 inches. Average annual temperature - 45° to 50°.

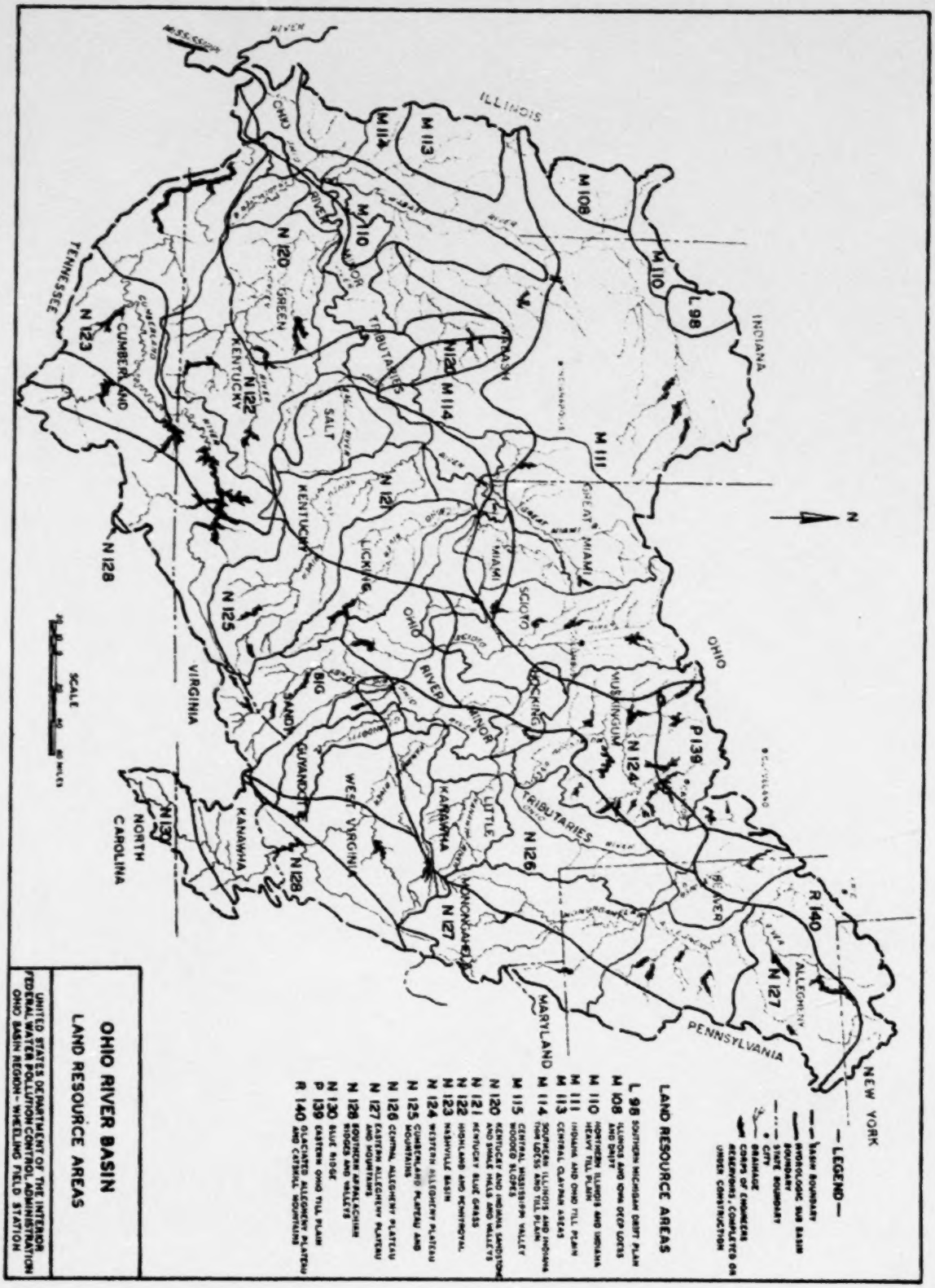
1/ Major Source: "Land Resource Regions and Major Land Resources Areas of the United States," Agriculture Handbook 296, Soil Conservation Service, U. S. Department of agriculture.

FIGURE 1



MAP OF EASTERN UNITED STATES (WITH THE OHIO RIVER BASIN OUTLINED) SHOWING CONCENTRATION OF SUSPENDED SEDIMENT IN STREAMS. (6)

FIGURE 2


OHIO RIVER BASIN
LAND RESOURCE AREAS
UNITED STATES DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
OHIO BASIN REGION - WHEELING FIELD STATION
LEGEND
BASIN BOUNDARY
HYDROLOGIC SUB BASIN BOUNDARY
STATE BOUNDARY
CITY
DRAINAGE
CORPS OF ENGINEERS RESERVOIRS, COMPLETED OR UNDER CONSTRUCTION
LAND RESOURCE AREAS
L 98 SOUTHERN MICHIGAN DRIFT PLAIN
M 108 ILLINOIS AND IOWA DEEP LOESS AND DRIFT
M 110 NORTHERN ILLINOIS AND INDIANA HEAVY TILL PLAIN
M 111 INDIANA AND OHIO TILL PLAIN
M 113 CENTRAL CLAYPAN AREAS
M 114 SOUTHERN ILLINOIS AND INDIANA THIN LOESS AND TILL PLAIN
M 115 CENTRAL MISSISSIPPI VALLEY WOODED SLOPES
N 120 KENTUCKY AND INDIANA SANDSTONE AND SHALE HILLS AND VALLEYS
N 121 KENTUCKY BLUE GRASS
N 122 HIGHLAND AND PENNYROYAL
N 123 NASHVILLE BASIN
N 124 WESTERN ALLEGHENY PLATEAU
N 125 CUMBERLAND PLATEAU AND MOUNTAINS
N 126 CENTRAL ALLEGHENY PLATEAU
N 127 EASTERN ALLEGHENY PLATEAU AND MOUNTAINS
N 128 SOUTHERN APPALACHIAN RIDGES AND VALLEYS
N 130 BLUE RIDGE
P 139 EASTERN OHIO TILL PLAIN
R 140 GLACIATED ALLEGHENY PLATEAU AND CATSKILL MOUNTAINS
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
NEW YORK
MARYLAND
VIRGINIA
NORTH CAROLINA
TENNESSEE
MISSISSIPPI RIVER
OHIO RIVER
GREAT MIAMI
MIAMI
SCIOTO
LICKING
KENTUCKY
SALT
GREEN
KENTUCKY
CUMBERLAND
BIG SANDY
GUYANDOTTE
KANAWHA
WEST VIRGINIA
MONONGAHELA
LITTLE KANAWHA
MUSKINGUM
BEAVER
ALLEGHENY
TRIBUTARIES
MINOR
SCALE
N

Soil: Medium to coarse textured acid and calcareous glacial drift soils are predominant throughout much of the area. Associated with them in flats and depressions are soils of medium to fine texture and organic soils. Medium textured dark colored soils occur on prairie lands along the southern edge of the area.

M. 108, Illinois and Iowa Deep Loess and Drift

Land Use: Mostly farmland, three-fourths of which is cropland. Ten percent of the area is in pasture, five percent in forest, and the remainder is urban or in other uses.

Topography: Mostly rolling to hilly, but there are large areas that are level to undulating.

Climate: Average annual precipitation - 30 to 35 inches. Average annual temperature - 47° to 53°F.

Soils: Most of the soils are deep and silty. Some are dark colored. A few are wet much of the time. Little of this area occurs in the basin.

M. 110, Northern Illinois and Indiana Heavy Till Plain

Land Use: Mostly farmed and mostly in cropland. Woodland less than five percent.

Topography: Nearly level to gently sloping glaciated plain.

Climate: Average annual precipitation 30 to 35 inches. Average annual temperature - 48° to 52°F.

Soil: Clayey and silty soils developed from glacial till. Many of the soils are dark colored. Little of this area occurs in the basin.

M. 111, Indiana and Ohio Till Plain

Land Use: More than 90 percent farmed and about 80 percent in cropland. Little woodland.

Topography: Gently sloping glacial till plain with some hilly moraines, kames, and outwash terraces. Narrow and shallow stream valleys are common.

Climate: Average annual precipitation - 35 to 40 inches. Average annual temperature - 50° to 55°F.

Soil: Silty and clayey soils predominate. Extensive areas of gravelly glacial outwash occur, however.

M. 113, Central Claypan Areas

Land Use: Nearly all in farms and three-fifths is cropland. Ten percent is in permanent pasture and about 15 percent is in woods. Five percent is urban.

Topography: Nearly level to gently sloping till plains. Shallow stream valley.

Climate: Average annual precipitation - 40 inches. Average annual temperature - 55°F.

Soil: Claypan soils overlain by silty mantle. Only a small part of the Central Claypan Areas occurs in the basin.

M. 114, Southern Illinois and Indiana Thin Loess and Till Plain

Land Use: Nearly all the area is in farms and about one half is cropland. One fifth of the area is in forest. Most of the remainder is in pasture. Five percent of the area is urban.

Topography: Dissected glacial till plain. Narrow to broad ridge tops and steep ridge slopes and valley sides.

Climate: Average annual precipitation - 35 to 45 inches. Average annual temperature - 53° to 58°F.

Soil: Thin to moderately thick silts over silt and clay till.

M. 115, Central Mississippi Valley Wooded Slopes

Land Use: Nearly all of the area is in farms and about two-fifths is cropland. One third of the area is in forest, mostly farm woodlots; most of the remaining farm land is in pasture.

Topography: Dissected glacial till plain with rolling narrow hilltops and hilly to steep ridge slopes and valley sides. Broad flood plains on major rivers.

Climate: Average annual precipitation - 35 to 45 inches. Average annual temperature - 53° to 58°F.

Soil: Mostly silty and clayey soils over glacial till and bedrock.

N. 120, Kentucky and Indiana Sandstone and Shale Hills and Valleys.

Land Use: Nearly all the area is in farms. About one-third of the area is in cropland. One-sixth of the area is in pasture and one-third is wooded. Strip mining for coal is fairly extensive.

Topography: Gently rolling to hilly dissected plateau. Narrow stream valleys.

Climate: Average annual precipitation - 40 to 48 inches. Average annual temperature 55° to 58°F.

Soil: Thin to thick loess mantle over residuum from sandstones and shales. Silt mantle absent in some areas.

N. 121, Kentucky Bluegrass

Land Use: Most of the area is farmed but just under one-third is cropland. Two-fifths of the area is in pasture and one-sixth of the area is in farm woodlots, mostly of poor condition.

Topography: Undulating to rolling limestone plain surrounded by shale and limestone hills having narrow tops and steep sides.

Climate: Average annual temperature - 55°F.

Soil: Silty and clayey soils developed from limestones or calcareous shales.

N. 122, Highland Rim and Pennyroyal

Land Use: Most of the area is in farms. About two-fifths is cropland, one-third is forest, and one-sixth is pasture.

Topography: Dissected limestone plateau. Western part of area characterized by narrow rolling ridgetops, hilly to steep ridge slopes, and narrow valleys.

Climate: Average annual precipitation - 45 to 54 inches. Average annual temperature - 55° to 60°F.

Soil: Soils developed from thin loess mantale; soils developed from cherty limestone, from sandstone, and from acid shale.

N. 123, Nashville Basin

Land Use: Almost all the area is in farms and about two-fifths is cropland geared to livestock production. One-third of area is in pasture and one-fourth is woodland.

Topography: Gently rolling to hilly limestone plain surrounded by deeply dissected areas with steep slopes.

Climate: Average annual precipitation - 50 inches. Average annual temperature - 58° to 60°F.

Soil: Mostly soils of medium texture developed from limestone.

N. 124, Western Allegheny Plateau

Land Use: Most of the area is farmed. One-fifth is cropland. One-fifth is pasture and two-fifths are in forest (half in woodlots and half in large tracts). Some strip mining occurs in northern portion of area.

Topography: Dissected sandstone plateau with narrow, level valley floors, rolling ridgetops, and hilly to steep ridge slopes.

Climate: Average annual precipitation - 40 to 45 inches. Average annual temperature - 48° to 55°F.

Soil: Fine sandy, silty, and clayey soils, with medium textures predominating.

N. 125, Cumberland Plateau and Mountains

Land Use: Four-fifths of the area is in forest, almost all of which is privately owned in small holdings. Mining and timber companies own some large tracts. Strip mining and shaft mining of coal is the major industry. Five percent of the area is cropped and a smaller amount is in pasture.

Topography: A deeply dissected sandstone and shale plateau area of steep to very steep slopes and narrow valleys. Mountain ranges along east and south.

Climate: Average annual precipitation - 42 to 56 inches. Average annual temperature - 55° to 60°F.

Soil: Stony soils on steep slopes. Medium textured soils on plateau tops and in valleys.

N. 126, Central Allegheny Plateau

Land Use: Most of the area is in farms. About ten percent is urban or in other uses. One-sixth of the area is cropland and one-fifth is pasture. Recently much farmland along the Ohio River has become industrialized. Nearly half of the area is in woods.

Topography: Dissected plateau with narrow rolling ridge tops separated by long steep ridge slopes.

Climate: Average annual precipitation - 35 to 45 inches. Average annual temperature - 50° to 55°F.

Soil: The soils are derived from interbedded sandstones and shales and from acid shales, calcareous shales, and limestones. Textures range from fine sands and coarse silts to silts and clays.

N. 127, Eastern Allegheny Plateau and Mountains

Land Use: Most of the area is in farms. About 15 percent is in other uses. Three-fourths is in forest, mostly privately owned. One-tenth is in National forest. Lumbering, gas and oil, and coal mining are important industries. One-tenth of the area is cropland. Less than one-tenth is in pasture.

Topography: A deeply dissected plateau with mountains along the southeast. Elevations reach 4,500 feet. Steep slopes are dominant but level to gently rolling plateau remnants occur in the north.

Climate: Average annual precipitation - 40 to 60 inches. Average annual temperature - 47° to 50°F.

Soil: Soils of the area are developed from acid sandstones, shales and red calcareous shales.

N. 128, Southern Appalachian Ridges and Valleys

Land Use: Three-fourths of the area is in farms. One-twelfth is Federally owned. One half of the area is in forest, mostly farm woodlots. One-sixth of the area is cropped and one-sixth is in pasture.

Topography: The area consists of northeast-southwest oriented ridges and valleys. Valleys are underlain by sandstones and shales and ridges and mountains by limestone and shales. Ridges and mountains are mostly steep.

Climate: Average annual precipitation - 35 to 55 inches. Average annual temperature - 50° to 60°F.

Soil: Soils are mostly of medium texture and developed from acid sandstones, shales, and limestone.

N. 130, Blue Ridge

Land Use: Two-thirds of the area is in forest, much of which is privately owned. One-fifth of the area is in National parks and forests. One-sixth of the area is in pasture and one-tenth in cropland.

Topography: Rugged mountains with steep slopes and sharp crests dissected by steep narrow valleys. Elevations reach 6,500 feet.

Climate: Average annual precipitation - 40 to 50 inches or more. Average annual temperature - 50° to 60°F.

Soil: Shallow, stony soils with rock outcrops occur conspicuously, but deeper soils developed from colluvium are more extensive. Textures are medium. Little of this area occurs in the basin.

P. 139, Eastern Ohio Till Plain

Land Use: Three-fourths of the area is in farms, one-fifth is urban, and the remainder in other uses. One-third of the area is in cropland, one-fifth in woods and about one-tenth in pasture.

Topography: Gently to strongly rolling dissected glaciated plateaus underlain by limestone and sandstone. Stream valleys are narrow and not deeply incised.

Climate: Average annual precipitation - 35 to 40 inches. Average annual temperature - about 50°F.

Soil: Silty soils with fragipans, silty and clayey soils, and coarse textured soils developed from glacial outwash.

R. 140, Glaciated Allegheny Plateau and Catskill Mountains

Land Use: Mostly in farms but a large acreage in cutover forests. The Catskills are used mainly for recreation. Sizeable areas are idle or abandoned land.

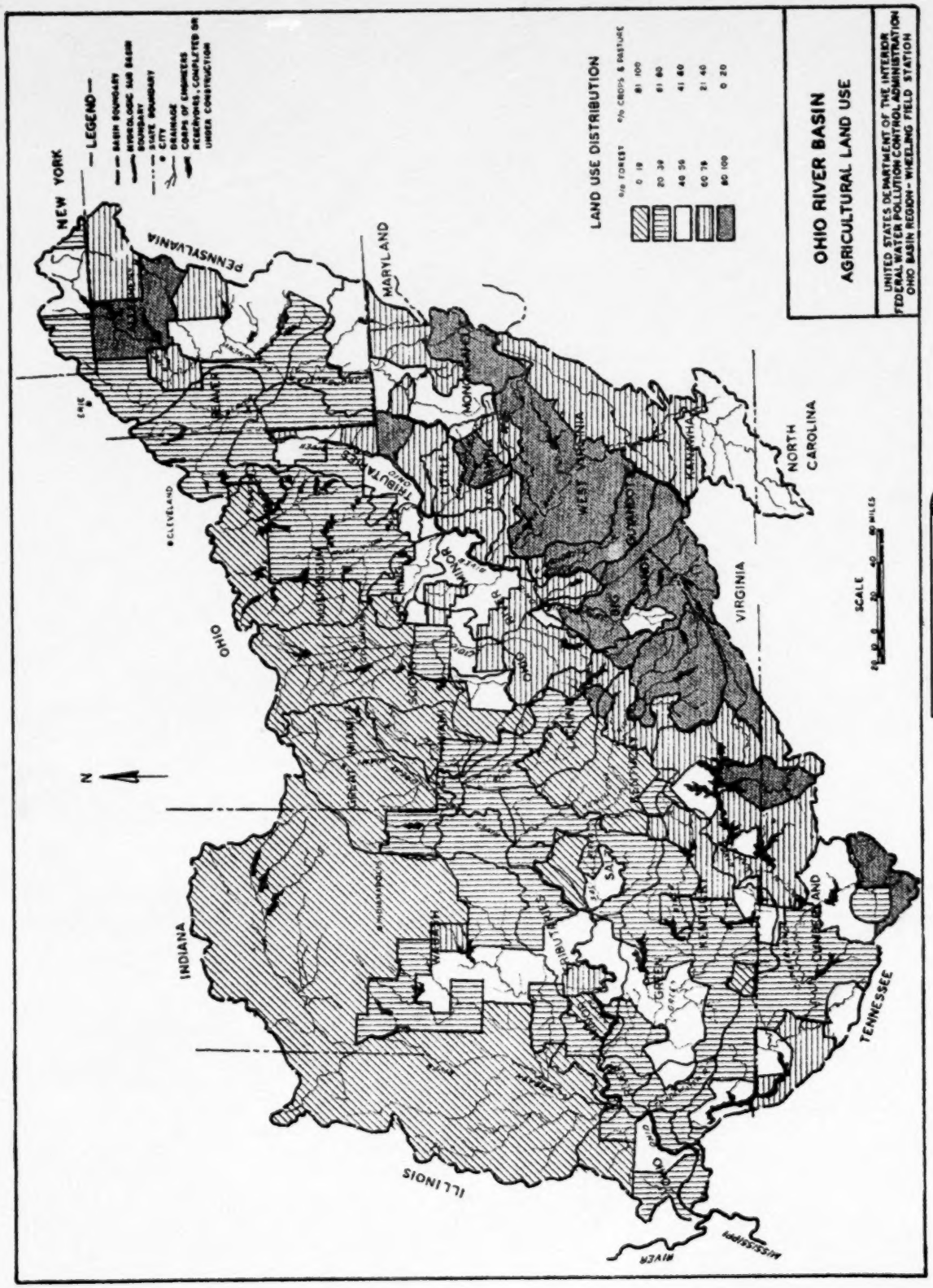
Topography: Tops of the dissected plateau are broad and nearly level to moderately sloping. The narrow valleys have steep walls. The Catskills to the east have steep slopes.

Climate: Average annual precipitation - 30 to 40 inches. Average annual temperature - 47° to 50°F.

Soil: Mostly moderately deep, stony, medium textured soils with fragipans. The soils are shallower and stonier on steep slopes. Deep outwash and alluvial soils occur in the valleys.

Generalized agricultural land use in the Ohio River Basin is shown in Figure 3. Land use, topography, soils, and climate are the major factors that determine sheet erosion rates and stream sediment volumes, as outlined in Section A of the Appendix. Information in Section B provides a generalized picture of the erosion and sedimentation potential of the Land Resource Regions in the Ohio River Basin.

FIGURE 3



Reproduced from best available copy.

BIBLIOGRAPHY

1. Hahn, C. H., Reservoir Sedimentation in Ohio, Ohio Department of Natural Resources, Division of Water, 1955.

2. U. S. Army Corps of Engineers, "Hydrology of the Ohio River Basin," Ohio River Basin Comprehensive Survey, Appendix C, 1965.

3. Lane, E. W., and others, "Report of the Subcommittee on Sediment Terminology," Am. Geophys. Union Trans., Vol. 28, No. 6, 1947.

4. Sayre, W. W., Guy, H. P., and Chamberlain, A. R., Uptake and Transport of Radionuclides by Stream Sediments, U. S. Geol. Survey Prof. Paper 433-A, 1963, 35 p.

5. Musgrave, G. W., "The Quantitative Evaluation of Factors in Water Erosion, A First Approximation," Jour. Soil and Water Conservation, Vol. 2, 1947, pp. 133 - 138.

6. Einstein, H. A., Anderson, A. G., and Johnson, J. W., "A Distinction Between Bed-Load and Suspended Load in Natural Streams," Am. Geophys. Union Trans., 1940, pp. 628 - 633.

7. Brune, G. M., "Trap Efficiency of Reservoirs," Am. Geophys. Union Trans., Vo. 34, 1953, pp 407 - 418.

8. Rainwater, F. H., "Stream Composition of the Coterminous United States, " U. S. Geol. Survey Hydrol. Atlas 61, 1962.